# Separation of a Homogeneous Mixture

**Introduction**

Mixtures consist of substances that do not react chemically. The proportions of these substances can vary in the mixture, and thus the mixture is said to be heterogeneous. These substances can be elements or compounds. Components of a mixture can be separated using one or more appropriate techniques. Typical separation techniques include *decantation, sublimation, filtration,* and *extraction.* Other techniques are available and depend on the substance's characteristics.

In this lab you will be given a heterogenous mixture of three substances. The mixture that you will separate contains three components, NaCl, $NH_4Cl$, and $SiO_2$. You will then determine the percentage of each substance in your mixture based on the mass of each as determined by your separation techniques.

**Safety**

Heating $NH_4Cl$ produces irritable fumes, make sure there is plenty of ventilation

Heating evaporating dishes to produce a solid can cause splattering of molten hot solid

**Materials**

Balance, Bunsen burner, tongs, evaporating dishes, clay triangle, watch glass, 50mL or 100mL graduated cylinder, Erlenmeyer flask, funnel, ring stands, iron ring, glass stirring rods, unknown mixture of sodium chloride, ammonium chloride, and silicon dioxide

**Procedures**

*Day 1*

1. Carefully mass a clean, dry evaporating dish (We will call this dish A) to 0.1 g. Obtain 2-3 grams of the unknown mixture in the evaporating dish. Weigh the dish & mixture & determine the sample's mass.

2. Place the evaporating dish (Dish A) on a clay triangle, ring, and ring-stand assembly either in the hood or in a well ventilated area, then heat the evaporating dish with the Bunsen burner using a low to medium flame until white fumes are no longer formed. *Heat carefully to avoid splattering.*

3. Allow dish A to **cool to room temperature**, then mass. Determine the loss in mass as the amount of $NH_4Cl$ in your mixture.

4. Add 15mL of de-ionizer water (DI $H_2O$) to the solid in the dish and stir gently for 5min.

5. Next, weigh ~~another evaporating dish (call this dish B)~~ and watch glass

6. Weigh a piece of filter paper and record the weight. Set up a filtering set up (Erlenmeyer flask and funnel and pre-weighed filter paper) and pre wet with a little DI water. *

7. Begin filtering the contents in evaporating dish A through the filter paper. If any solids remain in dish A, add 10mL more of DI water to dish and filter through. Once all contents of dish A have been filtered, rinse the solid in the filter paper with 5mL DI water. **DO NOT** discard filtrate (liquid in Erlenmeyer flask) it contains the Na Cl.

8. Carefully remove filter paper and contents from funnel. Place on paper towel in designated area to dry overnight.

*Day 2*

9. Transfer all of the filtrate to evaporating dish B**. Place evaporating dish B with the NaCl on the triangle on the ring stand. Heat using, low to medium flame, to dryness; ***cover with a watch glass near the end to avoid spattering*** (when there is barely any water left). Determine the mass of NaCl present in your sample by finding the mass of the evaporating dish B with the solid after the dish has cooled to room temp.

10. On Day 2 mass the dry filter paper and solid and determine the mass of the solid by the difference in the mass of the filter paper before filtering and after. This is the mass of $SiO_2$

* Ask Mr. Golden/ Mr. Heinz about alternate set up
** No need to transfer to evaporating dish B if using alternate set up

**Data:**

| | Mass (g) | Mass Dish + Sample (g) | Mass of Dish after heating (g) | Difference in Mass, loss of mass (g) |
|---|---|---|---|---|
| Dish A (Steps 1-3) | | | | |
| $NH_4Cl$ | | | | |
| Dish B | | | | |
| Watch Glass | | | | |
| NaCl | | | | |
| Filer Paper | | | (Dry filer paper and solid) | |
| $SiO_2$ | | | | |

**Analysis**

1. Using the masses of the three substances, determine the percentage of each in the original mixture. These percentages should add to 100%. Check with your instructor for actual values. Account for any discrepancies based on your techniques.

2. Why should you never weigh a hot object?

3. Other than filtration for separating NaCl and $SiO_2$ propose a different separation technique, (there is more than one method, hint: decanting)? Explain how and any limitations.

4. A mixture was found to contain 3.10 g $SiO_2$, 0.38 g of cellulose, and 6.72 g of calcium carbonate. What is the percentage of $SiO_2$ in the mixture?(mass percent)

5. Define the terms extraction, decantation, and sublimation.

6. Why were three rinses used for the NaCl extraction?

7. What is the term used by chemists that is opposite to sublimation?

8. Could the separations in this experiment have been done in a different order?

9. How could you separate barium sulfate ($BaSO_4$, ionic compound that does not dissolve in water – so do not use water to help with separation) from ammonium chloride ($NH_4Cl$)?